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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/717,547	11/21/2003	Takchiko Makita	31869-198826	7976

26694 7590 06/27/2005

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EXAMINER
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DEO, DUY VU NGUYEN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 06/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/717,547

Applicant(s)

MAKITA ET AL.

Examiner

DuyVu n. Deo

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 21 November 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 11/21/03.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 3 are rejected under 35 U.S.C. 102(b) as being anticipated by Moustakas (US 5,847,397).

Moustakas teaches a surface treatment method for a compound semiconductor such as GaN comprising treating the surface with a non-etching nitrogen plasma to reduce the formation of nitrogen vacancies (claimed recover from the damage due to nitrogen vacancies arising in a surface of the compound semiconductor) (col. 5, line 39-48).

### *Claim Rejections - 35 USC § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 5, 6, 8, 10, 11, 13, 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over admitted prior art and Moustaka (US 5,847,397).

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Admitted prior art, pages 1-3 of the specification, describes a method for forming HEMTs comprising: removing part of GaN (second compound semiconductor) by dry etching to partially expose a surface of the AlGaIn. Unlike claimed invention, admitted prior art doesn't describe nitrogen plasma treatment step to recover damage due to nitrogen vacancies arising in the expose AlGaIn surface. Moustakas teaches a surface treatment method for a compound semiconductor comprising treating the surface with a non-etching nitrogen plasma to reduce the formation of nitrogen vacancies (claimed recover from the damage due to nitrogen vacancies arising in a surface of the compound semiconductor) (col. 5, line 39-48). It would have been obvious for one skilled in the art in light of Moustaka to treat the compound semiconductor with N<sub>2</sub> plasma because it reduces the formation of nitrogen vacancies (col. 5, line 39-48), which is a problem recognized by one skilled in the art at the time of the invention (page 3 of the specification).

Referring to claim 10, the conventional method for forming HEMTs further comprises: forming the AlGaIn layer on a substrate and a GaN layer on the AlGaIn layer; forming a first and second main electrode on the AlGaIn layer; annealing the partially exposed AlGaIn layer; and forming a gate electrode on the exposed AlGaIn (page 2 of the specification).

5. Claims 2, 7, 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moustakas or admitted prior/Moustaka as applied to claims 1, 5, 10 above, and further in view of Lee et al. (US 6,762,083).

Referring to claims 2, 7, 12, Moustakas doesn't describe a plasma treatment for the compound semiconductor using a ICP (claimed ICP RIE) (col. 2, line 39-45). It would have

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been obvious for one skilled in the art to any apparatus that are available and known in the art as shown here by Lee as long as it can provide a plasma for the treatment process with a reasonable expectation of success.

6. Claims 4, 9, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moustaka or admitted prior art/Moustaka as applied to claims 1, 5, 10 above, and further in view of Gilbert et al. (US 2002/0072223).

Referring to claims 4, 9, 14, cleaning semiconductor with pure water is known to one skilled in the art in the process manufacturing device as shown here by Gilbert in order to remove contamination on the wafer (paragraph [0045]).

#### *Claim Objections*

7. Claims 1-4 are objected to because of the following informalities: claim 1 should be written as that of a method claim, which would have steps for performing the surface treatment (please see claim 5 for example). Appropriate correction is required.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DuyVu n. Deo whose telephone number is 571-272-1462. The examiner can normally be reached on 6:00-3:30; with alternate Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Primary Examiner

Duy-Vu N. Deo

6/23/05

